THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

PUBLISHED MONTHLY BY THE AMERICAN X-RAY PUBLISHING COMPANY

HEBER ROBARTS, M. D., M. E., Editor.

SUBSCRIPTION RATES—IN ADVANCE.

United States, Canada and Mexico	$3.00	Foreign Countries	$4.00
Single Copies	25	Single Copies	35

Editorial matter should be addressed to Dr. Heber Robarts, Editor, Suite 301 Chemical Bldg., St. Louis

All business matter should be addressed to The American X-Ray Journal Publishing Co., same address

All contributors of original articles and other matter relative to X-Radiance, of interest to the medical profession, are solicited from all parts of the world. Contributors will be furnished a liberal number of extra copies of the JOURNAL containing their articles.

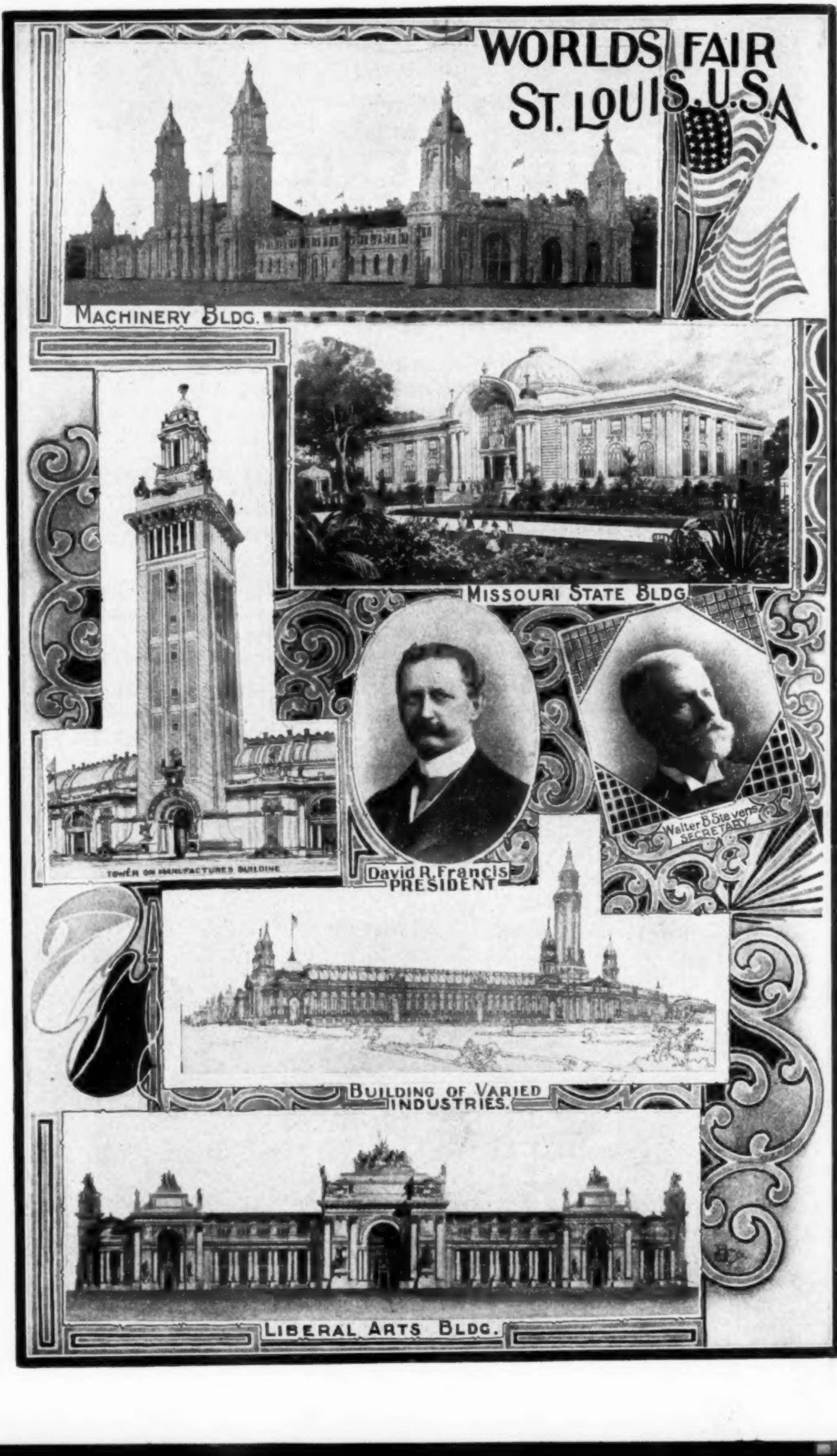
Translation of articles written in German, French and Spanish is made by Frank Ring, M. D., 611 Chemical Building, St. Louis.

Entered at the Postoffice at St. Louis, Mo., as Second-Class Matter.

VOL. 10. ST. LOUIS, APRIL, 1902. NO. 1.

CONTENTS OF VOL. 9, NO. 6

CONTENTS VOL. 10, NO. 1.


WORLDS FAIR
ST. LOUIS, U.S.A.
MACHINERY BLDG.
MISSOURI STATE BLDG
TOWER ON MANUFACTURES BUILDING
David R. Francis
PRESIDENT
Walter B. Stevens
SECRETARY
BUILDING OF VARIED
INDUSTRIES.
LIBERAL ARTS BLDG.

THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X Ray Work and Allied Arts and Sciences.

VOL. 10. ST. LOUIS, APRIL, 1902. NO. 1.

The Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E., Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A. B. C. teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 articles. Fully illustrated.

PREFACE.

In presenting these series of articles to the student of the new branch of diagnosis, I wish to express my obligations to the many of my collaborators and authors, whose various works I have freely consulted, asking from the reader kind consideration of my effort to describe fully and practically the progress of the x-ray since its discovery, the phases of which have changed, especially in diagnosis, and are still changing.

What are the x-rays?

We do not know just what the x-rays are, nor why they are produced under the conditions existing in a vacuum tube. But we do know that by following certain processes and making certain chemical combinations we can make as much x-rays and in such proportions as we want or need for penetration of certain objects. It is difficult to predict to what final uses the simple fact discovered by Prof. Roentgen, that different substances are more or less opaque to the x-rays, in proportion to their density, may be put, and what the near future will bring us in regard to the proper diagnosis in Surgery and Medicine. There are enormous possibilities lying dormant.

Emile Gautier says: "Suppose that we are looking at a photograph representing the skeleton of a pocketbook. There are the metallic parts, the frame, the leather lightly discernable, while inside are the key and a piece of money.

"Let us now see how the photographer produces this queer picture.

"First, he goes into his dark cabinet. He has no electrical apparatus or any other apparatus for that matter.

"He places the pocketbook on a sensitive plate. At the end of two or three hours he takes his plate, develops it, and we have the photograph of the pocketbook. All this has been done without sun or electricity.

"What kind of a miracle is this?

"It is simple. The photographer has left in the proximity of the plate a tube, containing a few centigrams of chloride of barium. This story reads like a fairy tale, yet it is only one chapter of the history of science.

"In 1896, M. Henri Becquerel made the discovery that the compounds of a metal called uranium, emitted peculiar rays, and the emission was spontaneous and constant. That is, he discovered that this matter has in itself its own light and that this light was eternal. This fact reversed all known principles of chemistry. These rays were given the name of Becquerel rays, and the substances emitting them were called radioactive.

"It was in studying the properties of

QH135p Am3

236941

the radioactive rays that the investigators ascertained in an ore, the ore of oxide of uranium, the existence of three substances. These substances were polonium, which was found by M. and Mme. Currie; the radium, which was also discovered by them; and the actinium, which was discovered by M. Debierne.

"These ores of uranium were secured at the state works at Jachymov, in Bohemia. Several thousand kilograms, besides tedious, expensive and hard labor, were required to obtain a few decigrams of the substances, which are now astonishing the scientific world. They partake at the same time of the properties of the cathodic and x-rays.

"These substances spontaneously generate electricity. In a laboratory of physics they upset all the apparatus. If the operator is saturated with their mysterious energies, he can not approach an electrical appliance without upsetting it. At a distance they produce a chemical reaction. One of the most wonderful results in connection with this is photographs as mentioned above. They are spontaneously luminous without undergoing any transformation to a perceptible degree.

"The price of these substances, owing to the difficulty of their production, practically annihilates their industrial value. But it is reasonable to suppose, that later on they will be produced as cheaply as aluminum, formerly so expensive and obtained so easily at small cost.

"We can already perceive the applications that will be made of these substances. It will be possible to treat wounds by the radioactive action of radium. The volts of radium may be used one day to cure neuralgia through slow emission of electricity.

"Anyone carrying in his pocket a few grains of the substances would be able to reproduce, and with what ease, all kinds of skiagraphs. With a sensitive plate he would be at liberty to read through solid bodies, as it has been demonstrated that the rays can penetrate through several centimeters of metal."

PART I.—LESSON I.

INTRODUCTION —*Apparatus for the production and application of Roentgen or X-Rays.*

Roentgen ray or x-ray diagnosis are the terms used to designate the methods which are employed for detecting of normal or abnormal conditions, disease or injury in some part or any organ of the human body; to observe during life the anatomical changes which can be recognized with the help of the x-ray only, or with the employment of the x-rays in connection with other methods of eliciting the signs of disease, or trauma. The proper significance of this method is shown, not by theory, but through clinical behavior and observation confirmed by the x-ray examination in all those cases where skiagraphy is possible. Inspection, Palpitation, Mensuration, Percussion and Auscultation, Blood count, Microscopical, Chemical and all modern methods of diagnosis are sometimes only subsidiary to these important findings of the x-rays. But for a complete and accurate exploration you must always employ all the different methods and modern means of diagnosis, to do your duty toward the patient and the profession at large.

The question of the value of the x rays in diagnosis of certain lesions seems to be settled; it is beyond the experimental stage and has come to stay. I desire to take this opportunity to urge the more general use of x-ray examinations by our profession and to repeat the warning again and again, that this branch should and must remain in our hands only, because there is a necessity of a great deal of refinement in operating the

x-ray, and its pictures, experience in examining, ability to read correctly the varying shadows, as well as a good deal of knowledge in anatomy, pathology, and physic. There are so many new "things", proprietary and otherwise, added to the list of the surgeon of today, that the individual can scarcely keep posted on all of them, but he will with great avidity appropriate those facts which can be instantly transformed into working force, and will always appreciate the demand for the practical, the utilizable, especially in the case of *early* and *proper* diagnosis.

Pushing aside the theoretical discussion and gain, from which is conspicuously apparent, it is well to review the results of actual, the good work only. For good x-ray work, the first requisite is an exciting apparatus, and *it makes no difference* if it is a coil or a static machine of good make. We are after the proper source of electricity, and nothing more. The knowledge of our apparatus, proper technique in each individual case, the knowledge of our Crookes' tube, the management of the same, the knowledge of the power of our x-ray produced, the distance of the tube from our object, the distance of the anode plate from the photographic plate specially prepared for the x-ray manipulations, the duration of exposure, the relative position of the tube to the object and the angle at which the picture or skiagraph is taken, are the first main rules in the photography of the invisible.

We have to know the capacity of our apparatus or the length of the spark, which may be produced. If a static machine is employed in our x-ray work, mark the number and diameter of revolving plates and their speed. If a coil is used, look always after current employed, remembering the amperage of the current passing to the tube. The best tube is the one which is known to you, and used every day, the one in which you know the distance between the anodal plate and the cathodal cup, the one in which you know and have learned to observe the quality of the vacuum backed up by a certain length of spark gap before radiance appears, and know all other points of individuality of the tube. Beside that, note the character of the photographic plate, when skiagraph should be made, the number of coatings of film, sensitiveness, the age of the plate and what support and the number of intensifying screens shall be used, if used at all. Also note the particulars of development, the developer used and all steps concerning printing, paper, etc. If we wish to make correct diagnosis in suitable cases for skiagraphy, and produce an accurate picture of the *status presens*, we must never be satisfied with one picture or skiagraph of the injured part or the diseased part examined, but make it also our duty to compare the picture of the diseased part with the normal one. We have to work as rapidly as possible, make short exposures and protect our patients. We always have to keep the obliqueness of the x-ray in mind, make skiagraph as near life size as possible, to get sharply defined outlines, remembering that we are dealing with shadows only, and use proper means of proof for measurements and exactness of our picture.

We will now briefly describe the different apparatus which may be employed as aids in x-ray diagnosis, and give some rules to guide us in their use.

APPARATUS REQUIRED.

The apparatus required for the production and application of the Roentgen or the x-ray, consists of following parts and accessories:

1. Source of electric current.
2. The Crooke's tube or the vacuum tube.
3. Induction coil or static machine with her own current, with or without Tesla's transformer.
4. Fluoroscope, fluorescent screen, skiameter.

5. Interrupter, with speed indicator and spark tester.
6. X-ray tube stand.
7. Moveable bar with wire-holder.
8. Connecting wires.
9. The casket.
10. Special dry plates or films.
11. Intensifying screens.
12. The copying frame.
13. The operating table. (Measuring stand for fluorometer).
14. Leaden box with diaphgrams for precluding the diffused rays.

The electric current may be generated by primary or plunge batteries, storage batteries or accumulator batteries, static machines, or the charging may be done by means of an electric light installation, thermo-piles, and constant, direct or alternating current.

To enable the observer to see the x-ray, it is necessary to employ a screen of tungstate of calcium or barium-platino-cyanide, which is mounted in a frame that can be stood on a table in the dark room or in the shape of a hand fluoroscope, which is a hood fitting closely to the face and excludes the outside light.

A B C of X-Rays.

We have arranged for a series of articles covering the entire teachings of the uses of the x-rays. This will include the physics of the apparatus, but more particularly the A B C or primary instruction in diagnosing and the therapy of radiant matter. The lessons will probably be divided into 20 sections, some of which will be liberally illustrated. No one interested in the x-rays and its teachings can afford to miss these lessons. They are unexcelled and absolutely new.

The Illinois School of Electro-Therapeutics, of Chicago, is doing good and faithful work and deserves the highest commendation.

Subscribe for The American X-Ray Journal—$3.00 a year.

The Value of the X-Ray as a Therapeutic Agent.

Read before the Roentgen Society of America, at University Building, Buffalo, N. Y., on September 11, 1901,

BY PROF. H. P. PRATT, M. D., of Chicago

In the x-ray we have an agent whose therapeutic value has been underestimated in certain cases and overestimated in others. This is probably due to the lack of sufficient knowledge on the subject, especially as to the nature and character of this force and its method of application. We must not be carried away with the idea that it is a cure-all; if so, we will certainly be disappointed. But with a thorough knowledge of the nature and effects of this force, we may reasonably expect good results. It has its field of work. A full knowledge of this field can not be acquired in a day, but only by months of hard labor. Every day's work brings to us added knowledge. The limit of its healing powers time alone will decide.

This force has been applied with good results in the following cutaneous and other diseases: Hypertrichosis, sycosis, favus, rosacea, eczema, psoriasis, lupus vulgaris and erythematosus; also in tuberculosis of the bones, joints and softer tissues. In epitheleoma, carcinoma, sarcoma and osteosarcoma, improvement, and in some instances, cures have been reported. Most of the above diseases have been reported cured or much improved in the for eign medical journals, by such men as Schiff and Fruend, of Vienna; Kemmell and Hahn, of Hamburg; Steinbeck, Seyneira and many others.

Admitting that the x-ray is of some therapeutic value, as we must in the face of the above authorities, let us refer to history and note the progress made along this line and the obstacles we have had to contend with. We have in this country quite a number of investigators and original experimentors, who are working

along the same lines as our foreign friends. Such men as Jones, of San Francisco; Knox, of Cincinnati; Johnson and Merrill; and in our own city (Chicago) such men as Burdick, Blackmarr and Pusey. Our worthy president, also our secretary, our treasurer and other members of this society are working along this line; and, in fact, each city can make claim to individual workers as well. The first investigators found it a difficult task to overcome the various obstacles that lay in their path; the lack of a suitable apparatus, such as coils, tubes, etc., and especially the prejudices of the profession. With time came a better apparatus, and the x-ray burn, which being indisputable proof of the power of the x-ray to do something, called the attention of the profession to its therapeutic value.

The first published account that I saw of the x-ray burn came from Berlin by cable, to the *New York Journal*, July 23, 1896, as follows: "Dr. Markuse, whose interior has been photographed thirty times within the last twenty days by the Roentgen process, has lost all of his hair as a result, and his face has assumed a brownish color. The skin has peeled off his breast where the instrument had touched it, and on his back, what was first a sore, finally developed into a bleeding wound, surrounded by burnt looking cuticle. The victim is exhausted." My attention was first called to the x-ray burn in April, 1896, when Prof. Wightman and myself inoculated Guinea pigs with the bacilli of tuberculosis and exposed them to the x-ray, which tookthe hair off from the pigs in patches, leaving a sore. This state of affairs began to check progress for a while, preventing further investigation. Scientists were endeavoring to determine the cause of these injurious effects. It, however, took further experiments out of hands of the tyro and brought about a more careful and systematic method of investigation. More than one man has sacrificed his life in the development of the x-ray. To my knowledge there has been five or six deaths.

I will now give a brief review of my own work in this field. On the morning of the seventh day of February, 1896, I saw the first account of Prof. Roentgen's work. Having been a student and teacher of physics and interested in college work, I had in my experimental laboratory a Ruhmkorff coil, Crookes and Geissler tubes, which had been in my possession for a period of over 20 years, used for experimental work, and I was somewhat familiar with the cathode ray and the changes in vacuum tubes. I had observed similar phenomena, so I was in a position to formulate a theory immediately, which was published in all the daily papers and in the electrical and medical journals. I then followed up a series of experiments to test the correctness of my theory. In the first part of April, 1896, with the kind assistance of Prof. Hugo Wightman, I succeeded in destroying the bacilli of eight different diseases, in culture tubes, as follows:

The bacilli of Cholera,
" " " Diphtheria,
" " " Influenza,
" " " Glanders,
" " " Pneumonia,
" " " Typhoid,
" " " Tuberculosis,
" " " Anthrax.

An account of this was published in the Chicago *Times-Herald*, on April 13, 1896, and republished in other dailies, and in electrical, scientific and medical periodicals. Immediately after destroying the above cultures, thereby demonstrating the therapeutic value of the ray, I commenced to use it as a therapeutic agent, and on April 13, 1896, the date of the above announcement, I placed my first cancer patient under treatment. A report of this appeared in the Chicago *Times-Herald* of April 14, 1896. The

most notable effects observed at that time were the relief of pain and the checking of the hemorrhages. This was a case of cancer of the stomach. On the 18th day of April, 1896, assisted by Prof. Wightman, I inoculated Guinea pigs with the bacilli of tuberculosis and exposed them to the x-ray with the following result:—Those exposed to the x-ray increased in weight and thrived; the others died. On the sides of the pigs nearest the tubes, as I said before, all the hair came out, leaving a running sore. This experiment was repeated several months afterward.

Cable to the New York *Journal:* "LYONS, June 25, 1896.—Prof. Lortet, who has experimented on Guinea pigs, says investigation proves that Roentgen rays prevent the development of the bacilli of tuberculosis."

On July 9, 1897, I exposed to the x-ray, rabbits which had been inoculated with rabies by Dr. Lagorio, of Chicago. Results unsatisfactory.

On April 17, 1896, I treated my first patient suffering from pulmonary tuberculosis. This patient improved under treatment. I, however, lost track of this case and have been unable to obtain a report before this meeting. On April 19, 1896, I placed my second case of pulmonary tuberculosis under treatment. The patient died several weeks afterward. He was too far gone and he only continued his treatment about a week and then left the city. This case was placed under treatment in the interest of the New York *Journal*, and reports can be seen in that paper at the time.

On May 20, 1896, the third patient suffering from pulmonary tuberculosis, was placed under treatment. This patient was referred to me for treatment by Dr. Frances Dickinson and Dr. Effie Lobdell, of Harvey Medical College. The patient was examined by Dr. Wm. Harsha, Dr. Geo. F. Hawley, Dr. J. C. Spray, Dr. M. F. Sterling, Dr. J. E. Gilman and others, of Chicago.

The following record of this case was kept by Dr. M. F. Sterling:

Case: Andrew Gorgan was born near Naples, Italy, in 1875. His parents were vineyardists; both are living and healthy. He has a brother of 17, who is a strong and healthy boy. In 1886, the family emigrated to America and settled in Ohio. Near their home was a large creek of very cold water, and Andrew often stole away to bathe there with the other boys, remaining in wet clothes often for hours. He caught cold after cold, and at last a nagging cough set in, of which he could not get rid. Suddenly hemorrhage set in, and for the first time, his parents took alarm. Physicians were summoned, but he never got anything more than temporary relief. Hemorrhages again and again recurred, growth ceased at this point, appetite became irregular and capricious, sleep restless and unrefreshing, there was constant fever and drenching night sweats. The parents now determined to move to Chicago, desiring to consult a wider range of medical skill than the Ohio town afforded. They arrived in the autumn of 1895. He at once began attendance at the clinics of the medical colleges in rotation; as he found no improvement in one he tried another. At last his case was pronounced hopeless by several specialists, and his father was directed to use anything to make him comfortable. Treatment was considered useless, and so he was given up to die. Early in 1896, the x-ray was a topic of anxious investigation to us, as to whether it had therapeutic value or not, until we placed tube culture of the bacillus tuberculosis under the ray and found that no further propagation occurred after exposure of two hours. This test was made time after time with different cultures, always with the same results.

This discovery was given to the world, and was received with much adverse criticism, and even ridicule, by all classes of the profession. To the initiated, the thoughtful and those who really desired to see the demonstration of the truth, every facility was given to verify the statements made. After all doubt was removed as to the cultures, the conservative criticism was advanced that, although tube cultures were unable to stand the x-ray, it might not be the same with bacilli in the human lung tissue in the living organism. It was thus that this unquestioned case was submitted for experiment. Before placing him under the ray, his height was 4 feet 11¾ inches, weight 74 pounds. The right lung from apex to mammary region was said to be one big abscess, discharging pus in quantity. Appetite was gone, digestion impaired, sleep restless and unrefreshing until nearly morning, fever constant, rising to 104 degrees. Hemorrhages recurred every four or six weeks, amount varying from a few mouthfuls to a breakfast cup full at each discharge. Of the leading specialists who passed upon him, the most hopeful placed his longest possible limit of life at about five weeks.

His x-ray treatment began May 20, 1896, at 1:15 p. m., and continued for two hours at each seance. Before treatment his temperature, pulse and respiration were taken; temperature 103.5 degrees, pulse 100, respiration 34. At the beginning of the second hour, temperature 102 degrees, pulse 120, respiration 28. At the end of the second hour, temperature 101.75 degrees; pulse 120; respiration 22. Half an hour after the treatment ended, temperature 101 degrees, pulse 100, respiration 20. At the end of the first hour of treatment Andrew was sleeping soundly.

May 23, temperature 99.5 degrees, pulse 112, respiration 36. Second hour, temperature 100.20 degrees, pulse 112, respiration 30. Third hour, temperature 99 8 degrees, pulse 98, respiration 35. The patient reports night sweats much lessened, no return of hemorrhage, which was threatening at last treatment. Feels stronger and appetite is improved.

May 26, 1:30 p. m.; temperature 99.3 degrees, pulse 110, respiration 28. Second hour, temperature 100 degrees, pulse 120, respiration 27. Third hour, temperature 100 degrees, pulse 120, respiration 30.

May 28, 1:30 p. m.; temperature 98 2 degrees, pulse 90, respiration 18. Second hour, temperature 98 5 degrees, pulse 96, respiration 18 Third hour; temperature 100 degrees, pulse 96, respiration 18

Cough much lessened in frequency; yesterday only two paroxysms during the day. Bowels regular, appetite voracious, sleep restful and dreamless; awoke only twice to cough and immediately slept again. Sweating much less, but still overnormal in amount.

June 9, 1:30 p. m.; yesterday felt so well that he attended an Italian wedding in his church. Attended the supper at night, overate and was taken to the drug store to be treated for colic.

Has gained one pound in body weight. Reports almost no cough during the day, but several times during the night. Is in fine spirits; begins to walk about freely. Urine excessive in quantity, has been so since the first.

First hour, temperature 98.5 degrees, pulse 100, respiration 20. Second hour, temperature 98.5 degrees, pulse 100, respiration 28. Third hour, temperature 98.5 degrees, pulse 86, respiration 18.

The variation in pulse, respiration and temperature, is dependent upon the distance of the tube from the chest wall and the strength of the current. The closer the tube the stronger the force, and hence, the more powerful the electro-therapeutic action. A rise, therefore, of pulse and respiration always oc-

curs under treatment, but this declines abruptly about an hour later.

June 13. He has gained another pound in body weight. Microscopic examination of the sputa shows marked decrease in the number of bacilli. Urinalysis showed that although the urine was in excess, the proportion of the solids was unchanged. He, today, walked two miles without fatigue. Appetite still in excess, digestion good; present weight 78 pounds.

June 30. Yesterday he attended an Italian picnic in Lincoln Park; sat on the wet grass for several hours, caught cold and all his symptoms showed acute nephritis.

Now says he had acute inflammation of the kidney four years ago, and for a time this was a very bad complication.

August 6, 11:45 a. m. Temperature 99 degrees, pulse 92, respiration 14. Second hour, temperature 99.5 degrees, pulse 84, respiration 16. Third hour, temperature 100 degrees, pulse 92, respiration 18.

Says he feels good, appetite and digestion very good. Cough almost gone, except in the morning a little. Urine shows specific gravity 1014, reaction neutral. Sediment normal, no sugar, no blood, no albumen.

September 3, 1:30 p. m. Yesterday, wrestled to try his strength, then ran to a street corner and jumped on a street car in motion and got a sudden wrench; began to cough and brought up a small quantity of blood. Greatly frightened, but today no rise of temperature, pulse, or respiration. On examination found the blood came from the back of the throat. Complains of the throat being sore on swallowing; says he has eaten two pecks of peaches and one large watermelon without asssistance in two days. Complains of pain over the kidneys recurring at intervals. Small calculi voided with much pain. Microscopic examination of sputa shows only very few bacilli, in all not more than four in six slides.

June 23, 1897. Andrew Gorgan is in fair health. No fever or night sweats. Good appetite, sound sleep, and can walk for miles without great fatigue. From the day he took his first treatment he has never had the slightest hemorrhage from the lung; can take a deep breath without coughing. He is now simply weak and requires country air and a change from his very unsanitary surroundings.

This patient was in comparatively good health until his death, which took place July 9, 1900. Four months before his death he was at my office feeling better than he ever had. A few weeks later he took a severe cold and had an attack of pneumonia, which he partially recovered from. He finally died after an operation had been performed upon his foot or leg, I don't remember which, which resulted, as I understand, in blood poisoning. He had suffered for three or four years previously with stones in the kidneys, and we were in hopes that he would be able to be operated on for them. This case was reported by Dr. Finley Ellingwood, in the *Chicago Medical Times*, July, 1896, and by Dr. J. E. Gilman, before the Clinical Society, of June, 1897, and published in their official organ, *The Clinic*, July 15, 1897. From June 1, 1896, to March 1, 1901, I have treated for J. E. Gilman, over 50 patients, suffering from tuberculosis, cancerous, asthmatic, rheumatic, syphilitic and skin diseases, with the x-ray. I refer you to him for data of cases.

On June 8, 1896, Dr. John B. Murphy, of Chicago, referred to me for treatment a patient, suffering from lupus-vulgarus. The treatment continued for about three months, at which time the patient was discharged cured. The patient came to my office a year afterward feeling in the best of health. There was no re-

currence up to that time. She, howevever, left the city and I have been unable to obtain a final report in time for this paper.

On Oct. 21, 1896, Dr. Finley Ellingwood referred to me a patient, suffering from tuberculosis of the kidney. She was discharged cured by the doctor in about four months. The patient is still alive, and as Dr. Ellingwood informed me a few days ago, is enjoying the best of health.

For the results of the other patients treated by me for the various physicians, I will refer you to them for full data.

The pioneer worker's path is not strewn with roses. No sooner had we announced the destruction of the bacilli on April 13, 1896, and before the ink was dry, a cable from London to the *New York Journal*, dated April 14, 1896, stated that Dr. T. Glover Lyon had just tried similar experiments with negative results, and that the statements made by us, that we had accomplished it, were false.

On April 15, 1896, a cablegram came to the *New York Journal*, from Prof. Roentgen, which is as follows:

"Your dispatch tells me diphtheria was slain outright in the Chicago experiments, while no final and positive verdict is as yet given as to the effect on the bacilli of cholera, pneumonia, typhoid, and other plague germs tested. This is astonishing and partly disappoints my anticipation. I consider diphtheria and cholera the most deadly of plagues and believe positively that the bacilli of the other scourges would be the least difficult to kill. But I am confident that eventually the x-ray will prove an effectual cure for all such diseases.

"I will rejoice when it will be in the power of every competent physician to kill those bacilli. Then once having located them, the modus of annihilation will be mere technicality.

"If Profs. Pratt and Wightman have successfully completed their experiments, their names should go down to posterity as benefactors of the race, since humanity is immeasurably benefited by their work."

"What are your plans for the future?" was the next question.

"You know," he said, "that my original invention was accidental, but I am now going home full of new ideas to finish every detail.

"It is possible that I will hit upon the same modus of Profs. Pratt and Wightman.

"I am fully prepared and will have much better equipments to continue any investigations, and I will do so on my own lines, looking neither to the right nor to the left.

"All professional men are heartily welcome to my conclusions, though in their struggle to obtain the best possible results, each must go his way."

In answer to the question whether he had any conception of Prof. Pratt's methods, Prof. Roentgen said:

"I would rather not guess at Prof. Pratt's methods, but I am eagerly expecting further particulars, though as far as my own studies are concerned, I do not believe that they will be abrogated or adversely influenced by them. Americans sometimes accomplish great things in a hurry. We prefer to work more slowly and with greater deliberation. In conclusion let me repeat that I anticipate the usefulness of the x-ray in the cure of all manner of diseases from the start."

In the above dispatch, Dr. Roentgen also complimented me, thinking I was his old friend, Prof. Pratt, of Johns Hopkins University. After he discovered his error, he kept quiet for a short time until he had tried experiments on the bacilli of diseases. Then he made the statement that the x-ray was not a therapeutic agent, as it had no effect upon the tissues of the human body.

Just about this time Prof. Minck, of Munich University, succeeded in partially destroying the bacilli of typhoid fever.

On April 16, 1896, the following cable was received from Vienna: "The assertions made by Chicago professors, to the effect that they have established proof that Roentgen rays will kill bacteria of cholera and other diseases is regarded here as worthless, and the alleged discovery is absolutely false. Doctors of Vienna and Munich have proved to the contrary."

On April 27, 1896, Prof. Wm Schroeder, head of the electrical department of the University of Missouri, and Prof. Hickman, the bacteriologist, destroyed the bacilli of diphtheria in culture tubes. On August 1, 1896, they inoculated Guinea pigs with bacilli of diphtheria.

Several theories have been advanced to explain the nature and character of the x-ray. The two principal ones of today are the English and the German. The former is that of irregular transverse vibrations in the ether, the latter longitudinal waves of Hertz. Neither of these two theories seem to be quite satisfactory.

It appears to me that if we consider the x-ray as an electric current of very high potential, which makes its circuit from the inner surface of the tube outward, perpendicularly to the surface, then radiates in straight lines until the potential falls, when the rays return to complete their circuit by the terminals, we have a simple and practically useful explanation of all the phenomena.

After it was discovered that the x-ray possessed the power of blistering and burning the skin, the papers were filled with various warnings. My business, as well as that of others in this line, dropped off. No one wanted an x-ray picture taken, much less treatment.

The following theory, suggested by me, was published in the *Times-Herald*, April 13, 1896, the date of the original announcement, explaining the reason for the destruction of the bacilli:

"The magnetic force from the x-ray passes directly into the affected tissues. Electrolysis results, the chemical decomposition liberates oxygen, which unites with the free oxygen of the body and makes ozone. Ozone will kill every bacterium the human body possesses. The present state of the experiment proves outright murder in some instances and inability to work in others.

"The effect in either case, is eventually the same to the patient. The tissues in the latter instance gain new strength and drive out bacilli."

Eight months after this there was published in the daily papers, dated Dec. 6-7, 1896, the following article, defending the x-ray as a healing medium. I quote this in full, as it shows the same line of thought suggested in my original announcement, and also helps you to appreciate my position in the matter.

"Recently much has been published about the injurious effects of the x-ray upon the human body, such as its producing abscesses, burning and blistering of the skin, shedding the hair and finger nails, etc. For the last eight months I have had patients under the x-ray in my laboratory from 9 a. m. to 6 p. m., duration of treatment varying from a half hour to four hours at each sitting, and not once with any bad result in any case.

"After the Crookes tube is excited by the coil, the magnetic lines of force are projected down, in the same manner as they pass off from a magnet, and traversing the intervening space, pass through the body down to the floor, and back to the coil and tube again, completing the circuit.

"The x-ray is electrostatic in character and of a very high potential. With every discharge from the Crookes tube oxygen is liberated in the body as well as in the surrounding atmosphere which,

combining with the nascent oxygen, forms ozone.

"It is due to the electrolysis produced in the body that we are able to destroy the bacilli in contagious diseases; ozone being the most powerful germicide known.

"The ozone generated between the tube and the body does not produce the burning, etc., noted; it is the increased current which, passing through the body, produces electrolysis, the skin being of a higher resistance than the rest of the tissues.

"This same condition of burning takes place under the galvanic and static currents if excessive use be made of them. Except for potential alone, the two forces are identical.

"In some of the Eastern states criminals are electrocuted. Here electrolysis is carried to extreme, destroying the whole body; but the product of partial destruction exhibits abscesses, etc.

"In the disastrous treatments given and reported, the unskilled operators used a current in the apparatns of too high tension, and instead of hastening normal physiological change, carried their treatment to a point of electrocution. Strychnine is a good drug when used by a skillful physician, but a danger when in the hands of a tyro.

"It must not be forgotten that electric phenomena are very powerful, and not every man who can buy a machine is capable of applying it. The electrical machine must be as skillfully adjusted to each individual as the microscope to a specimen submitted to it. It is a treatment full of danger if ignorantly or rashly handled, but beyond price in value to the skilled and careful electro-therapeutist."

We will now take up the subject of x-ray tubes.

The hard and soft tubes are the same as high and low vacuum tubes. The x-rays are produced by the bombardment of the molecules of residual gas against the inner surface of the tube. The number of molecules of residual gas in the tube determines the degree of vacuum, as to whether it is a hard or soft tube.

The x-ray tube when excited, acts in a similar manner to a condenser or Leyden jar. It discharges in one direction, the outer surface of the tube becomes electro-positive, while the inner surface is electro-negative.

The tubes, as a rule, are excited from the terminals of the Ruhmkorff coil or the static machine. The current is established through the molecules of the residual gas in the tube, thereby connecting the cathode with the anode. Each oscillation in this circuit causes the molecules of residual gas to bombard the inner surface of the tube, which point of impact is the source of the x-ray.

When the tube is excited, some of the molecules of the residual gas are thrown from the cathode, striking the platinum disk or anode, which serves as a target, causing the molecules to rebound and strike the inner surface of the tube. This point of impact on the inner surface of the tube, as I said before, is the source of the x-ray. Every molecule of gas striking the inner surface of the tube, causes one or more lines of magnetic force to be thrown out at right angles to the surface of the tube. The distance to which the lines of force are projected or, in other words, the limit of the penetrating power of the ray, depends entirely on the potential of the tube, and this in turn depends on the force of the impact of the individual molecules of residual gas. The higher the vacuum, the less the number of molecules of residual gas in the tube, the greater the free path, the higher the potential, the greater the penetrating power. The lower the vacuum the greater the number of molecules, the less the free path,

the lower the potential, the less the penetrating power.

All substances through which the x-ray passes, form part of the x-ray circuit.

The x-ray circuit is the same as any other electrical circuit. It has its return forming an endless chain of molecules arranged in series. The higher the potential the greater the number of molecules added to the chain, the longer the chain; and vice versa.

The circuit is formed first from the point of impact on the inner surface of the tube, being directed outward until the potential drops, then returning to the tube through the terminals.

The x-ray is electro static in character, an accumulation of lines of magnetic force of high potential and short wave lengths in a circuit. They decompose every substance capable of being decomposed in their path and render every substance over which they travel a conductor of electricity.

The light which is emitted from the tubes is the result of the decomposition of the molecules in the atmosphere around and inside of the tube This light is not the x-ray current. The x-ray force is purely electrical and is invisible.

The softer the tube (limited) the greater are the number of the lines of force thrown out and the stronger the x-ray current, which increases decomposition; but the penetrative power is decreased.

The harder the tube the less the number of lines of force thrown out, and consequently the weaker the x-ray current and the less the decomposition, but the greater the penetrating power.

For good therapeutic effects, use a soft tube, increase or decrease the primary current to suit the case, but be careful to avoid x-ray burns. The ordinary hard tube will not burn during any reasonable time of exposure.

It has been my aim to establish the proposition that this new force is simply an agent or element for producing electrolysis and to give a more comprehensive idea of this force, I may restate my hypothesis based on "electrolysis," which is the "disassociation of the elements of a compound by the aid of electrical energy." When a direct current is applied to the body, be it the galvanic, the static or x-ray current, for the x-ray current is as much a current as the others, electrolysis ensues, producing a continual dissociation and association of the elements of the body as long as the current is applied.

The stronger the current the greater is the number of ions evolved, and vice versa. Ions are the products of electrolysis. Those evolved at the anode or positive pole, or on the surface of the body nearest the tube, are termed anions, and those evolved at the cathode or negative pole, on the opposite side of the body, away from the tube, are termed kations.

There are two distinct forms of reaction produced, found in the polar and interpolar regions. The polar region is the region of the body that comes in contact with the poles or electrodes, or the surfaces of the body; the interpolar region, the region between the poles, or within the surfaces of the body.

When the direct or x-ray current is applied to the body, immediately electrolysis takes place, driving all the electropositive elements or ions along the lines of force away from the positive pole or anode, or surface of the body nearest the x-ray tube, to the cathode which is on the opposite side of the body, and all of the electro-negative elements or ions away from the negative pole or cathode, or opposite side of the body, to the anode in the direction of the tube. In other words, all of the electro-positive elements are repelled from the anode or surface of the body nearest the tube, but attracted to the cathode on the opposite side of the body away from the

tube; and all the electro-negative elements are repelled from the cathode, or the surface of the body on the opposite side away from the tube, but attracted to the anode or surface of the body nearest the tube.

The sodium chlorid, formula Na Cl, and water, H_2 O, the chlorin and the oxygen being electro-negative, are repelled from the negative side, but attracted to the positive. The hydrogen atoms of the solution being electro-positive are repelled from the positive side, but attracted to the negative side of the body. The accumulation of the ions at the negative pole, side, or cathode, called kations, have an alkaline reaction, while anions are of acid reaction. The two poles or surfaces are sometimes known as the alkali and acid poles and if the current is sufficiently strong to produce vesication (which is the x-ray burn) the effect of the local cautery at the negative is similar to that of an alkali (caustic potash), and the one at the anode similar to that of an acid (hydrochloric acid).

When an electrical current is applied to the human body it renders every portion of the body over which the lines of force pass (in the interpolar regions) aseptic. The current is antiseptic by virtue of the generation of ozone in the body, due to electrolysis. Ozone is one of the most powerful germicides known, and the integrity of the whole body is due to its presence. (Ozone is of neutral reaction). A sufficient amount of ozone in the human system will destroy all pathogenic microbes. In the polar regions we have two forms of action, which are purely local, having a varied effect upon the pathogenic microbes. We find forms of microbes that will thrive in an acid medium, but will be destroyed in an alkaline medium, and vice versa. Any form of microbes that can be destroyed by aid of an acid, can be destroyed with the positive pole of a galvanic battery; and those that are destroyed by an alkali will succumb to the negative pole. Remember that the acid radicals accumulate at the positive side (anode), and the alkaline radicals at the negative side (cathode).

The physiological effects of the anode and cathode on the tissues of the body are diametrically opposite. For instance, the ions found at the anode have an acid reaction, those of the cathode are alkaline. At the anode the circulation is diminished, at the cathode it is increased. At the anode the tissues are dehydrated, at the cathode they are hydrated. At the poles albumen is coagulated, at the cathode slightly, at the anode to an extreme degree. In the anode we have an acid cautery, in the cathode an alkaline one. The acids accumulated at the anode will destroy a large number of varieties of pathogenic microbes, while the alkalies accumulated at the cathode will destroy the rest. Andrew Gorgan was treated with the x-rays current for about six months, after which he remained in fairly good health, with temperature, pulse, and respiration normal until about four months before his death, which was due to pyaemia, not tuberculosis. Just before his death I was notified of his condition and requested his family in event of his demise to notify me immediately, so we could hold a post mortem, to determine if possible, the effect of the x-ray on the lung tissue. As this was one of the first patients treated with the x-ray, an autopsy would have been of great interest and benefit to science. Owing to extremely rapid decomposition they were forced to bury him immediately, thereby preventing a post mortem.

Taking into consideration that one lung was entirely gone before treatment began and the other one was seriously impaired, to stop the progress of the disease and to heal up the lungs at that late date, was little short of a miracle,

we had succeeded in keeping him alive for over four years and he enjoyed reasonable health.

The therapeutic properties of the x-ray may be summed up as follows:

The force from the x-ray tube is electrostatic in character and of very high potential, it acts on matter in the same manner as any electro-motive force; that is to say, it produces a dissociation of molecules along its lines of force, which is electrolysis, it may be used for cataphoresis.

The x-ray is a germicide through the liberation of the ions (which is electrolysis) along its lines of force; collecting in the polar region at the anode, anions (of acid reaction); at the cathode, kations (of alkaline reaction); in the interpolar region, ozone (of neutral reaction).

The x-ray, through the liberation of the ions, hastens physiological changes, or metabolism, causing a temporary rise in temperature and an increased elimination of waste products by the lungs, skin and kidneys, at the same time increasing the activity of the phagocytes.

The softer the x-ray tube (limited) the stronger the current, and consequently, the greater the electrolytic effect on the tissue.

In treating cancerous, tuberculous and other infectious diseases, more attention should be paid to the degree of vacuum in the tube, than to the apparatus used in exciting the tube. The degree of vacuum and the amount of current necessary can only be determined by actual experience coupled with a thorough knowledge of electro-physics and physiology.

For superficial and deep cancer, use a low tube and vary the current according to the depth of the lesion.

With reasonable care and proper insulation the x-ray burn can be avoided. The lower the tube the greater is the danger of producing a burn, owing to the increased number of lines of force thrown off from the tube. The area of the x-ray burn is limited, and it is not dangerous except with excessive use.

All of the x-ray burns produced, so far as I am able to learn, are due to the lack of proper antiseptic measures.

The microbes and impurities in the atmosphere are driven into the body, where, after a period of incubation, they set up a form of septicemia.

The x-ray tubes for therapeutic work, should be much larger than any of the tubes on the market. The average size should be from 18 to 20 cm. in diameter, or as large as the tube can be made and properly exhausted. The larger the tube the greater the number of lines of force thrown off, the stronger the current and the greater the electrolytic effect on the tissues.

Owing to the rapid discharge from the x-ray tubes, the eyeball is placed on a strain, especially if the fluoroscope is being used in making examinations, particles which are freed from the screen during decomposition and are driven along in the direction of the x-ray force, striking the eye, setting up an acute conjunctivitis, which seems to be one of the detrimental troubles that x-ray operators have to contend with. It becomes necessary to use a mild lotion in the eyes almost daily to allay or prevent this conjunctivitis. The remedy used must be simple and of such a nature as not to injure the eye in the least.

The preparation that I have used for the last five years, and the only one that has, so far, proved satisfactory in my case, is a prescription written by one of our local celebrities. I have forgotten the formula, but it is marketed under the name of "Murine."

One of the strongest proofs that the x-ray circuit is an electrical circuit, is that a picture can be taken of an object on the back of a photographic plate, away from the tube, showing a return of the lines of force.

As a preventative of x-ray burns, a screen must be used; a sheet of steel or of lead, arranged with a window cut into it about 14 inches square. On the side of the window nearest the tube, a celluloid screen of ¼ of an inch in thickness is placed. This is to prevent the microbes and particles of dust being driven into the body, and at the same time allows the x-ray to pass through without much interference, as it offers but a slight resistance to the ray. Back of the celluloid screen, away from the tube, I have shutters made of steel with openings in their centers, varying from one inch to 12 inches in diameter. These shutters are interchangeable. I use another screen made of lead-foil, which is arranged in close contact with the body, with holes cut into it the size and shape of the part that is being exposed to the ray. The patient is placed four to five inches from the tube. The celluloid, steel and lead plates are between the patient and the tube. Then the tube is crowded by increasing and decreasing the current, as required for the part of the body being submitted to the treatment. A low vacuum tube or soft tube, as it is sometimes called, should be used in treating all cases.

In treating lupus, increase the current until, as shown by the fluoroscope, a faint outline of the bones of the hand is seen.

In treating deep or internal cancer or tuberculosis, increase the current until the bones of the whole skeleton are visible. The length of time of exposure depends entirely upon the susceptibility of the patient to electrical influence.

At the last meeting of the Chicago Electro-Medical Society the Research Committee made a preliminary report on Priority in X-Ray Therapeutics, showing that the first successful attempt to destroy bacteria by means of x-rays was made by Drs. Pratt and Wightman, of Chicago, in April, 1896. Dr. Pratt also preceded by a few days Drs. Lortet and Genoud in the successful treatment of Guinea pigs after inoculation with the bacilli of tuberculosis, and was the first to apply the new radiations to the treatment of both cancer and tuberculosis in the human subject.

The final report of the committee, giving a summary of the work done in x-ray therapeutics during the year 1896, will be presented at the next meeting of the society. T. P. HALL,

March 7, 1902. Secretary.

The *Chicago Medical Times*, July, 1896, gives an account of Dr. Pratt's experiments with tuberculosis patients.—ED.

Tube and Exposure.

Dr. J. P. Hetherington, of Logansport, Ind., in writing to us, concludes his letter:

"It seems to me such a mistake for writers to state they have taken a radiograph in so many minutes. In nearly all illustrations, the only record of details given, is 'exposure (so many) minutes.' Such a record is no assistance or information for any one. We might as well prescribe a certain dose of medicine for all—babies or adults—without reference to conditions or desired results. The only way a radiograph can be useful to others—aside from a mere illustration—is to give all important details; and I believe you would add to science and the interest of your readers if you would require: Static machine or coil; make or form of tube; tube hard, medium or soft; make or brand of plate; length of exposure, and developer. I keep such a record of every plate I make and it is a wonderful assistance to look over the plates and observe where the results come from. It goes without saying that each tube is always worked with a strength of current that will develop its best radiance. I do not believe we will approach a *standard* any other way.

The length of exposure depends upon conditions which, if not given, renders the illustration scientifically useless. I do not believe my German 30-centimeter tube of low vacuum would make a radiograph in 5 hours that my high vacuum Wehnelt will make in 5 minutes or less on my 18 inch coil.

"How interesting and instructive it would be if each of us would take our favorite 'crack' tube to the next meeting of the Roentgen Society in Chicago, for comparison. Less than ten days after Dr. Price exhibited his voltohm and defended its merits in Buffalo, I could not find a voltohm for sale anywhere.

"Yours sincerely,

J. P. HETHERINGTON."

Roentgen Rays in Medicine and Surgery.

This book disappoints the x-ray worker. It is a nicely bound work, but the lasting impression it furnishes is its advertising a particular make of a machine. The book has the strong ear marks of Mr. Rollins, whose technical versatility has been much read and much admired. We regret exceedingly the book leans so much upon one side—forgetting the real essentials. Mr. Hinze is an admirable young man and a hard worker. He deserves encouragement. In fact, all parties concerned in the making of the book, deserve the best. This is about the sense of the description of the book that comes to us. One writer says: "I have seen Dr. Williams' book. It is a good, illustrated work, but not for the practitioner. The latest technique is forgotten altogether. There is nothing there about the method of skiagraphing the internal structures of bones; nothing about the beautiful skiagraphing of the chest by Dr. Donath, or internal organs on the under-exposed plate with the intensifying screen and the lead box and nothing about the latest method of localization with fluroscope, made stereoscopic or fluorometric conveniences. None of these are found, though known more than two years to the members of the Roentgen Society of America."

Radiant Ore in United States.

The following letter will explain itself and is a valuable contribution to the literature of the subject. ED.

TELLURIDE, Col., Dec. 1, 1901.

DR. HEBER ROBARTS,

St Louis, Mo.

Dear Sir:—I received a few days ago, the Nov. number of THE X-RAY JOURNAL, with a red cross in one corner, and so I hasten to send you the necessary $3 for another year's subscription.

While I am not at present engaged in radiography nor electrical work, yet I never miss reading every line of your valuable Journal, expecting to take up the work again before many months.

I send you in this letter a rather poor print from a negative made with a piece of uranium ore, which is found plentifully a few miles from here. This mineral is "Carnotite," or a uranyl-vanadate; $U_2 O_3$, $V_2 O_3$, and is a sandstone impregnated with the oxides. The mineral also contains radium, polonium and zirconium.

Under separate cover I will send you a small sample of this mineral and also a piece of "Rocoelite," a sandstone containing $V_2 O_3$, (about 3 per cent).

These two minerals are both impregnations of the same sandstone formation, sometimes as separate layers and often intermixed.

The gircon crystals are easily collected in the residue after treating with hydrofluric acid.

Hoping these will be of some interest to you, I remain Yours respectfully,

ORR ADAMS.

Subscribe for THE AMERICAN X-RAY JOURNAL—$3.00 a year.

College Station, Tex., Dec. 30, 1901.
Dr. Heber Robarts,
St. Louis, Mo.

Dear Sir.—Please send The American X-Ray Journal for two years, beginning with the number for January, 1902, to the Department of Physics, A. & M., College Station, Texas.

Please send me back numbers (one each) of Vol. 1, No. 1; Vol. 1, No. 4; Vol. 2, No. 2; Vol. 3, No. 2; Vol. 4, No. 3; Vol. 4, No. 5; Vol. 5, No. 2; Vol. 7, No. 4. If there are any of these which you can't supply, please include them in the ad below.

Please insert the following ad. in the next two numbers:

"Wanted.—Back numbers of The American X-Ray Journal, Vol. 1, No. 3; Vol. 5, No. 5; Vol. 6, Nos. 1-3-4-5-6; Vol. 7, No. 6. Send postal to D. W. Spence, Prof. Physics, A. & M. College of Texas, College Station, Texas."

Please send me *duplicate* bills for all of above made out against Dept. of Physics, A. & M. College of Texas, and oblige,
Yours Truly,
D. W. Spence.

[We regret our inability to supply the missing numbers of the American X-Ray Journal Prof. Spence needs for the Library of the State University. Readers who can spare such numbers or have duplicates will kindly write to the Professor. Ed]

Battle Creek, Mich., July 21, 1901.
Dr. Heber Robarts, St. Louis, Mo.

Dear Doctor:—I have been a reader of the X-Ray Journal since Vol 1 and No. 1, and a worker in x-ray work for the Battle Creek Sanitarium, since its first advent in '96, and am interested in all that pertains to it. On page 934, July number, you show a plate for a static machine made in two pieces. I wish to say that in one of my visits to Dr. Younghusband (now deceased), of Detroit, Mich., he showed me one of his machines that he had made with plates the same as the illustration in your X-Ray Journal, produced by Dr. J. M. G. Beard, only his plate did not narrow up at the bottom, but was made with a straight base. When I first saw it, it was in the year 1894, but on my next visit to the doctor, he had disposed of the machine and I gathered the idea that the divided plate impaired the output of the machine. I write this for your benefit and others you may desire to call the attention to.

Fraternally, H. A. Dow.

Perry, Iowa, December 10, 1901.
Editor X-Ray Journal:

A new motor desired to run a Static or x-ray apparatus. Will some genius invent a contrivance for driving a static machine, that you can wind up like a clock or a peanut roaster and run long enough to give a good static seance of half an hour's duration. Bring out an inventor. How many feet of wire rope and what weight would it require to a shaft and gearing, to run a static machine for thirty minutes, 250 revolutions per minute?

Up here, and in many places, there is no electric service or water pressure; hence an electric or water motor are out of the question, and a noisy gasoline engine is too high priced.

Please reply in next issue.

When your usually well behaved static machine goes on a strike and changes polarity while in motion, either when giving an insulation or while doing the invisible, it is owing to its warning you to cleanse the glass disks with a clean, dry, woolen cloth, scour the brass-work combs and brush-rods, axle buttons, etc., with strong aqua ammonia and whiting. This will remove grease and gum coating that comes from using calcium chloride (fused), sulphuric acid, etc. Also removes the corrosion from ozone, and your machine will work as

good as a new one and spark equal to a buxom widow in the dark and pick up its charge as expeditiously as the lady would a kiss. Electrically thine,

DR. JOHNSON.

101 Newhall Street.

BIRMINGHAM, ENGLAND, August 12, 1901.

HEBER ROBARTS, Esq. M. D.

Dear Sir:—I have long intended to write to you but since my return from South Africa, I have had so much to do that my time has been fully occupied. I am now engaged in writing a book on the x-rays, and should very much like to have a complete set of your journals from the first. Can you let me have them? I have only seen my last article since my return, and am very pleased with the way in which it was produced. I am herewith sending you a copy of a paper I read a few days since; it has not yet been published in England. You can do what you like with it. I have any amount of material for papers, but I am afraid that I shall have little time at present to send you anything. I, however, shall not forget you when the time comes. Hoping that you are well, with kind regards. Yours truly,

J. HALL EDWARDS.

Protection for X-Ray Workers' Hands.

By G. E. Pfahler, M. D., Assistant Chief Resident Physician and Skiagrapher to the Philadelphia Hospital.

Nearly every one who makes frequent fluoroscopic examinations or demonstrations with x-rays, suffers more or less from a dermatitis of the hands. This effect varies from a mere hyperaemia or pigmentation to fissures and ulcerations, followed by contractures. Some men are compelled to abandon the work entirely, while others continue to make themselves martyrs to the medical profession. This part of our work is not taken into consideration in the compensation for our labors. Therefore it behooves us to take every possible precaution for its prevention, and especially those of us who engage in general medical or surgical work, as it unfits us for our regular duties.

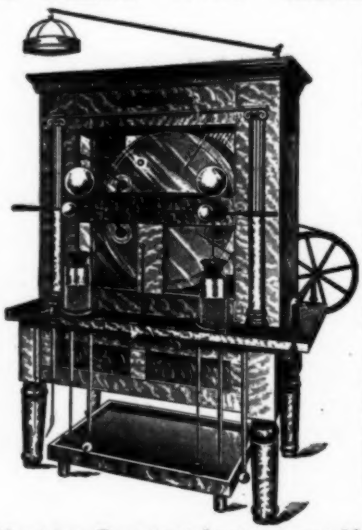
For this purpose I have had constructed a pair of mittens covered upon the backs with lead-foil. The mittens were made of chamois skin, though almost any substance will do. They should be made to fit loosely. For the lead-foil I used heavy tea-foil or lead. Adhesive plaster was placed over the top of the lead and the edges sewed to the mittens to hold it in place. All the ordinary manipulations neccessary can be made with these mittens.

The irritations of the developing solutions may be prevented by the use of rubber gloves. Since I have taken these precautions my hands are improving and I trust that this suggestion may be of value to others.

Multiple Use of Static Machine While Running.

Dr. W. B. Clark, of New Albany, Ind., has recently written to us of the use he makes of the static machine. In order that time and expense may be saved, he runs an insulated wire to adjacent rooms from his machine and operates Crooke's tubes and treats patients at other points all at the same time. He does not claim originality—save for himself—has not heard of others using the machine in this way.

Have You Got It?
Not $300, not $200, not $150 for an 8-plate, but
$125.00 CASH,
for a High Grade Perfection
16-PLATE Static and X-Ray MACHINE.



Elegant Oak Case. Platform, Crown Breeze, Electrodes, Etc., Etc. All Complete.
For a limited time only. Send for our bargain bulletin.

Western Surgical Instrument House,
647-653 W. 59th St., Chicago, Ill.

SAFE

The Central Pacific Oil Co.

is the only Oil Company in the world whose stock is GUARANTEED to pay six per cent interest per annum for eight years.

THIS is the only Oil Company with enough ***rich land*** to warrant a responsible and conservative financial institution like the Continental Building and Loan Association of San Francisco, in absolutely guaranteeing the interest on the stock for eight years.

You take no chances—the Trust Company, which has investigated every feature of the Central Pacific proposition, assumes all risk and guarantees investors six per cent for eight years, this guarantee being attached to every share of stock you buy.

The Central Pacific Oil Co. offers you the great chance of your life to get ahead in the world. Owning 2,500 acres of land that fairly reeks with oil, and under the management of competent officers selected by a board of directors whose standing in Southern California is absolutely unimpeachable, this Company offers the soundest, safest and most profitable investment before the business men of America today.

100,000 shares of stock is offered at 50 cents per share. No more at this price when this block is gone.

Send draft to A. Samuel Parks, Secretary, or Wells Fargo, or to our depository, the Broadway Bank and Trust Co., Los Angeles.

MONEY BACK IF YOU WANT IT.

Purchasers of the first hundred thousand shares of this stock will have the option of returning same to the Company at the expiration of one year from the date of purchase and receive the full amount of cash paid for the same with interest at six per cent per annum less any dividends paid on said stock, provided 60 days' notice be given the Company of such intention.

Security Real Estate, Investment and Loan Co.

FISCAL AGENTS,

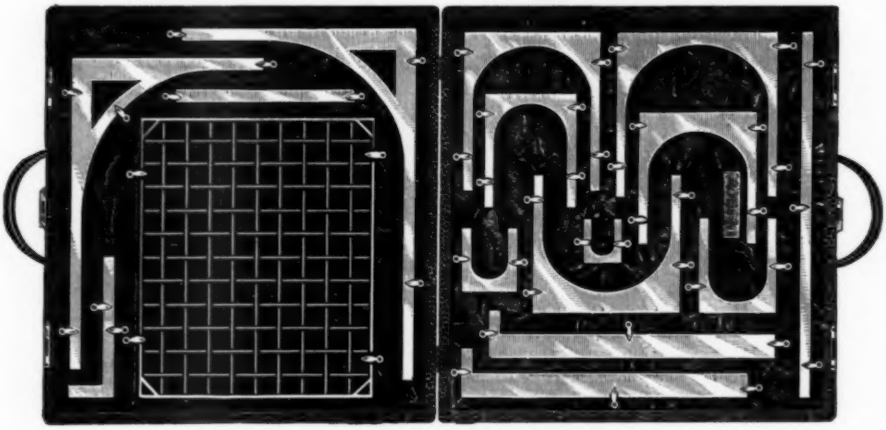
NORTHEAST CORNER EIGHTH AND OLIVE STREETS,

Suite 306-307 Chemical Building, ST. LOUIS, MO.

—THE—

DENNIS FLUOROMETER.

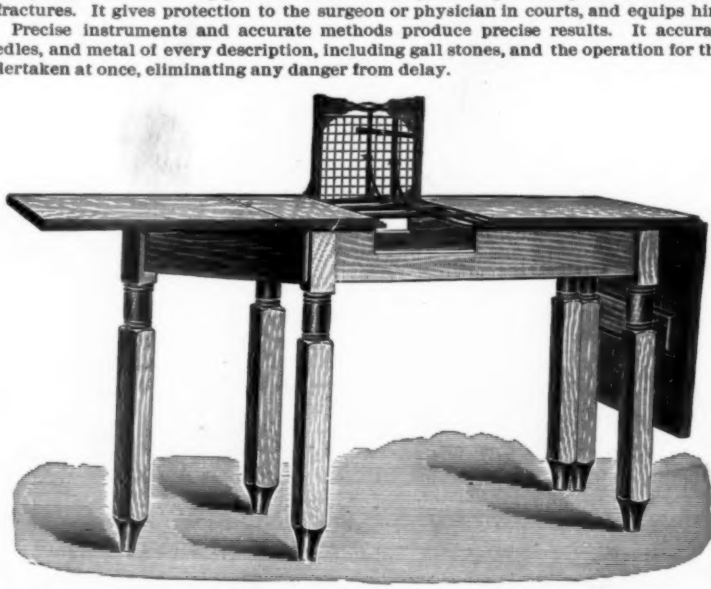
Necessary Surgical Adjunct of X-Ray Work.



Patented April 27, 1897. Velvet Lined Case.

THE DENNIS FLUOROMETER is the only instrument that furnishes accurate cross-sections and measurements, rectifies distortion of position and distortions caused by the divergence of the rays.

It forms a perfect shadow of any por ion of the anatomy, making it indispensable in cases of dislocations and fractures. It gives protection to the surgeon or physician in courts, and equips him for expert testimony. Precise instruments and accurate methods produce precise results. It accurately locates bullets, needles, and metal of every description, including gall stones, and the operation for their removal can be undertaken at once, eliminating any danger from delay.



Observation and Operating Table. Quarter Oak, highly finished.

Write for illustrated catalogue, giving full description, prices and terms.

The Rochester Fluorometer Co.

225 Cutler Building, Rochester, N. Y.

Truax, Greene & Co.

42, 44, 46 Wabash Ave.,
CHICAGO, U.S.A.
Manufacturers, Importers and Dealers in

All Forms of Electrical Apparatus Known to Medical Science.

A Product of Our Own Factory.

OUR WALL CABINET

May be furnished for cells 110-220 or 500 volt direct com. currents

Special points of merit are:
High Tension Coil,
Shunt Graphite, Rheostat,
Standard "Dead Beat,"
Mil-am-meter,
Automatic Rheotome.

We will be pleased to forward prices on application.

X-RAY MACHINES For Any Circuit.

Direct or Alternating. Battery or Lighting.
We have a new line of PORTABLE MACHINES

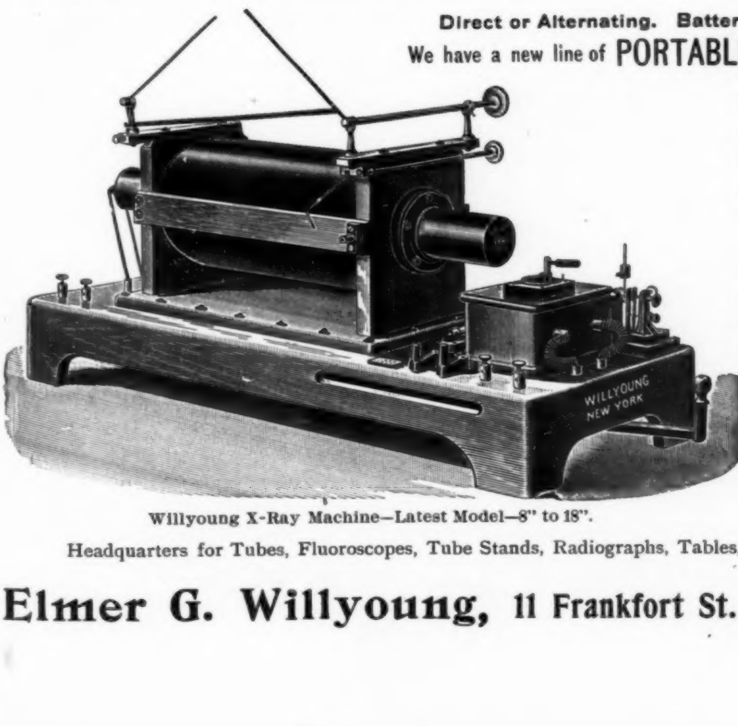
Very compact and very powerful, with improved spark gaps, independent interrupter, etc.

—o—

Then there is the

Cunningham Mercury Jet Interrupter,

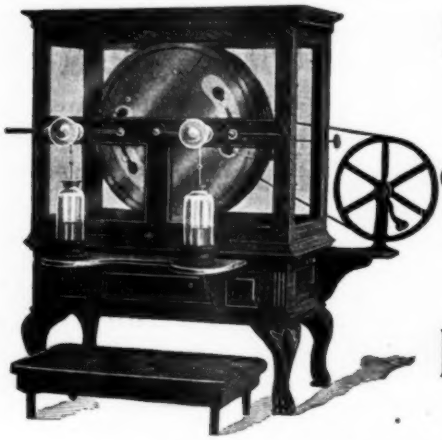
Giving interruptions variable at will, from 10 to 10,000 per minute, and breaking current up to 30 amperes.



Willyoung X-Ray Machine—Latest Model—8" to 18".

Headquarters for Tubes, Fluoroscopes, Tube Stands, Radiographs, Tables, Etc., Etc.

Elmer G. Willyoung, 11 Frankfort St., New York.



Electro-Therapeutic Manufacturing Co.

Galvanic, Faradic and Cautery Batteries, Cabinet, Wall and Table Switch Boards, Electric Bath Outfits.

Sole Manufacturers of the

Patee Static Machine

(PATENTED)

For X-Ray and Therapeutic Uses.

TWO VALUABLE AND EXCLUSIVE FEATURES.

1. **Insulating Hard Rubber Bands,** around the stationary plates, preventing leakage, and thus delivering more current to the prime conductors.

2. **Movable Equalizing Rods ensure quick supply of current** and no annoying delays, just as you are ready to use your machine.

The above features are controlled by United States patents.

HIGH CLASS GOODS--CLOSE PRICES.

21 W. Maryland, - - INDIANAPOLIS, IND.

ILLINOIS SCHOOL OF ELECTRO-THERAPEUTICS.

INCORPORATED.

OFFICERS: C. S. NEISWANGER, Ph. G., M. D., Pres. EMIL H. GRUBBE, M. D., Vice-Pres. A. B. SLATER, Sec'y and Treasurer.

FACULTY:

FRANKLIN H. MARTIN, M. D., Electricity in Gynecology.
W. FRANKLIN COLEMAN, M. D., M. R. C. S., (Eng.) Electricity in Diseases of the Eye.
ALBERT H. ANDREWS, M. D., Ear, Nose and Throat.
C. S. NEISWANGER, Ph. G., M. D., General Electro-Therapeutics.
EMILE H. GRUBBE, M. D., Electro-Physics, Radiography and X-Ray Diagnosis.
MAY CUSHMAN RICE, M D., Electrolysis.
EDWARD B TAYLOR, M. D., Neurology.
GORDON G. BURDICK, M. D., Radio-Therapy and Photo Chemistry.

This School is for physicians and is equipped with the most modern, up-to-date apparatus. All the rudimentary physics will be profusely illustrated and made plain even to the uninitiated in electro-therapy. No mail courses will be given and no degrees will be conferred, but a handsome engraved certificate of attendance can be obtained, if desired, after the completion of a course. The courses will be of three weeks' duration, and consist of both clinical and didactic instructions. A two weeks' course will make you self-dependent. Write for further information, terms and printed matter.

ILLINOIS SCHOOL OF ELECTRO-THERAPEUTICS. 1301-2-3 Champlain Bldg, Chicago, Ill.

"THE ONLY WAY."

ST. LOUIS TO CHICAGO.

4 PERFECT TRAINS 4

Morning, Noon, Night and Midnight,

EVERY DAY IN THE YEAR.

The equipment of these trains is matchless in every detail. Free Chair Cars; Pullman Compartment and Standard Sleepers; Cafe Dining Cars; Parlor Cars with Observation Platforms.

CHICAGO & ALTON RAILWAY.

Write for time-tables, rates, etc., to D. BOWES, Assistant Gen'l Passenger Agent, St. Louis, Mo.

One need not Use an X-Ray

To ascertain that

The Best and Direct Line

FROM MISSOURI POINTS

—and—

Southeast and Southwest

—TO—

Points in Iowa, Minnesota,

North and South Dakota

and the **Northwest**

is the......

IOWA CENTRAL RAILWAY.

Through Sleeping Cars.

Chair Cars and Coaches Daily.

See that your ticket reads via the

IOWA CENTRAL ROUTE.

For rates, folders, or any information, call on any coupon ticket agent, or address

GEO. S. BATTY, G. P. and T. A., Marshalltown, Iowa.


MOBILE
AND
OHIO
R.R.
ST. LOUIS
CAIRO
ARTESIA
MONTGOMERY
MERIDIAN
CITRONELLE
MOBILE
NEW ORLEANS
JACKSONVILLE
Citronelle
Alabama.
ON THE GREAT PINE BELT PLATEAU OF THE SUNNY SOUTH.
WORLD FAMED AS AN ALL-THE-YEAR HEALTH RESORT


HIGHEST AWARD
AT
PAN AMERICAN
WHY?
ANALYZE
THE MERITS of our MICA PLATE STATIC MACHINE and you will see that our claims are well founded.
Two MICA PLATES more than equal 10 glass ones.
MICA PLATES can not crack nor break but last indefinitely.
They are so tough they may be run over 2000 revolutions per minute.
High speed develops a current far superior for X-Ray and most therapeutic purposes.
R.V. WAGNER & CO.
308 DEARBORN ST. CHICAGO.

"The Best Antiseptic

is undoubtedly that which is the least harmful to man in the dose required for asepsis."—M. DUJARDIN BEAUMETZ.

LISTERINE,

a safe, trustworthy, non-toxic antiseptic, answering every requirement of the physician and surgeon. In special practice, notably Laryngology and Rhinology, Listerine occupies an unrivaled position by reason of its excellence and wide range of utility.

An interesting little brochure, entitled:
"The TREATMENT of DISEASES of the RESPIRATORY SYSTEM."
will be mailed to your address, upon application.

Lambert's Lithiated Hydrangea,

a remedy of acknowledged value in the treatment of all diseases of the urinary system and of especial utility in the train of evil effects arising from a uric acid diathesis.

A pamphlet treating of "*Regal Derangements*" may be had by addressing

Lambert Pharmacal Co.
ST. LOUIS.

PORTABLE STORAGE BATTERIES

That Are Really Portable.

Light weight for large capacity. Put up in hard rubber carrying boxes, with handles. Splendid Batteries for all kinds of work.

We refer, by permission, to Dr. Heber Robarts, Editor, "The American X-Ray Journal."

MINIATURE ELECTRIC LAMPS.
SMALL MOTORS.
POCKET VOLT AND AMPERE METERS.
DRY BATTERIES.
DENTISTS' MOUTH ILLUMINATOR.

MARION ELECTRIC CO.,
203 Broadway, New York City.